

REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 1-7 remain active in the application subsequent to entry of this Amendment.

In item 2 of the Official Action claim 5 is objected to as being an improper dependent claim. In order to advance prosecution, and without any prejudice to disclaimer, this claim has been withdrawn.

The claims are amended in order to more particularly point out and distinctly claim that which applicants regard as their invention and to include significant features which further distinguish the claims from the applied prior art. More specifically, the independent claims 1-3 are amended to reflect a minimum average valence for the nickel hydroxide resulting from the oxidation step of greater than 2.3 and to define a maximum average valence for the nickel hydroxide resulting from the reducing step of not greater than 2.3. The importance of valence control is explained throughout the description and in particular in the paragraph bridging pages 5 and 6 of the specification. No new matter is added by these amendments. These features serve to further distinguish the active material manufactured by the method of the present invention from the active material obtained by the procedure described in the cited prior art, as discussed in more detail in the comments that follow.

The amendments to the claims proposed above find ample basis in the original description of the invention and these amendments serve to advance prosecution.

The reasons why the positive active material of the present invention includes nickel hydroxide and β -NiOOH is described in various passages of the specification, in particular paragraphs [0002]-[0005].

Briefly, the reaction between divalent nickel hydroxide and trivalent nickel oxide is not a completely reversible reaction. Thus, a phenomenon occurs involving suspending the discharge reaction at a valence oxidation number of 2.2 when nickel oxyhydroxide is converted back to nickel hydroxide during discharge. The negative electrode always has electricity left in it in an amount corresponding to a valence of 0.2. This remaining electricity makes no contribution to battery capacity.

In order to eliminate this remaining electricity at the negative electrode, a nickel oxide having an average valence of greater than 2.3 (higher order nickel hydroxide), which is obtained by chemically oxidizing nickel hydroxide, is used as a positive active material.

The inventors have found that γ -NiOOH, which is difficult to discharge electrochemically, is generated together with β -NiOOH which is easily dischargeable electrochemically in the case of chemically oxidizing nickel hydroxide as a method for producing higher-order nickel hydroxide for the positive pole active material. The produced γ -NiOOH hinders the electroconductivity of the obtained higher-order nickel hydroxide, thereby deteriorating its utilization and decreasing the discharge capacity when an alkali battery is constructed with a positive electrode containing the same.

In order to overcome this drawback, the present inventors have found it effective to carry out a method of excessive chemical oxidation to an average valence greater than 2.3 on nickel hydroxide to generate γ -NiOOH which is difficult to discharge electrochemically together with β -NiOOH and then selectively reducing γ -NiOOH in a succeeding reducing step to an average valence of not greater than 2.3. As fully explained in paragraph [0009], during reduction γ -NiOOH is reduced more easily than β -NiOOH, therefore, the ratio of the content of β -NiOOH is increased.

Turning now to the rejections stated in the Official Action, items 3, 4 and 5, claims 6-7 are rejected as being anticipated by Ovshinsky, claims 1-3 and 5-7 are rejected as unpatentable over Ovshinsky in view of Maruta (U.S. 6,333,126), while claim 4 is rejected over the same combination of references in combination with JP 11-144723. All of these rejections are traversed.

The cited references Ovshinsky and Maruta fail to discuss the average valence of the nickel hydroxide. Therefore, even if Ovshinsky and Maruta are taken into consideration, the features of claims 1-3 including "a higher order nickel hydroxide including nickel hydroxide, β -NiOOH and γ -NiOOH, an average valence thereof being greater than 2.3 is produced by the oxidizing step" is not obvious. Similarly, it is not obvious that "a higher order nickel including nickel hydroxide and β -NiOOH, an average valence of thereof being not greater than 2.3" also required by claims 1-3.

The reference JP 11-144723 fails to describe a reducing step as required by applicants' claims. According to '723, nickel hydroxide is reacted with oxidant such as sodium hypochlorite in the oxidizing step so that the higher order nickel hydroxide, an average valence thereof being 2.1 to 2.3. On the other hand, according to the present invention, in the reducing step γ -NiOOH contained in the higher order nickel hydroxide having an average valence greater than 2.3 is reacted to the reducing agent such as hydrogen peroxide so that the higher order nickel hydroxide having an average valence 2.1 to 2.3 is obtained – this is specifically claimed in claims 1-3.

Even if '723 is combined with Ovshinsky or Maruta, '723 is relevant (if at all) only to the oxidizing step, not reducing step.

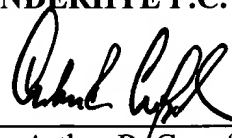
From the above amendments and comments it will be apparent the prior art documents applied in the current Action are not suggestive of the claims now under review.

For the above reasons it is respectfully submitted that claims 1-4, 6 and 7 define inventive subject matter. Reconsideration and allowance are solicited.

Respectfully submitted,

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